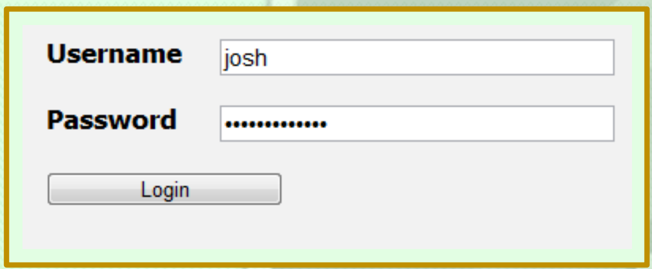
SOUL System

Secure Online USB Login System

Everything is going online

- Social Interactions
- Banking
- Transactions
- Meetings
- Businesses
- … including **all sorts of crimes** and even **war**

Our online identities



Username josh

Password ••••••••••••••

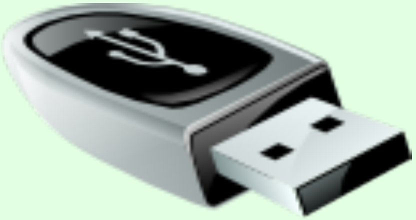
Our IDENTITY = Our PASSWORD

What if your password gets stolen?

- Identity Theft
- Money Loss
- Data Loss
- Privacy Problems

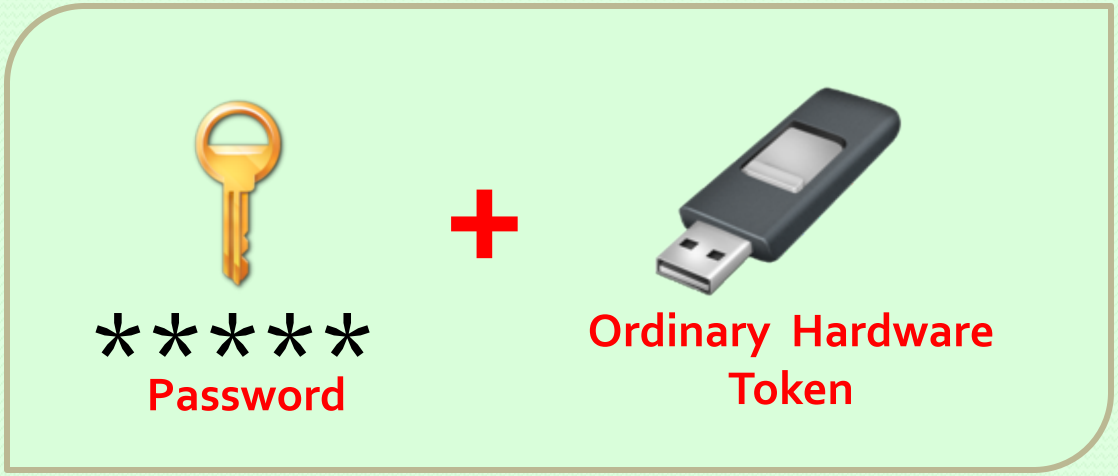
Our PASSWORD = $

Available "Solutions"

Technology	Problems
https://	**Security**: Prone to keylogger and brute force attacks **Cost**: SSL Certificates cost a lot of money
	**Practicality**: Requires specialized hardware token **Cost**: Hardware component alone will cost money **Visibility**: Immediately recognizable security token
👍	**Practicality**: Requires specialized hardware devices **Cost**: Hardware component alone will cost money **Consistency**: Never 100% accurate and foolproof

Our Solution – **SOUL System**

- **Create a two-factor authentication system that converts an ordinary hardware token (e.g. USB Flash drive) into a security token**



*****
Password

+

Ordinary Hardware Token

Secure

Low-cost

Practical

Invisible

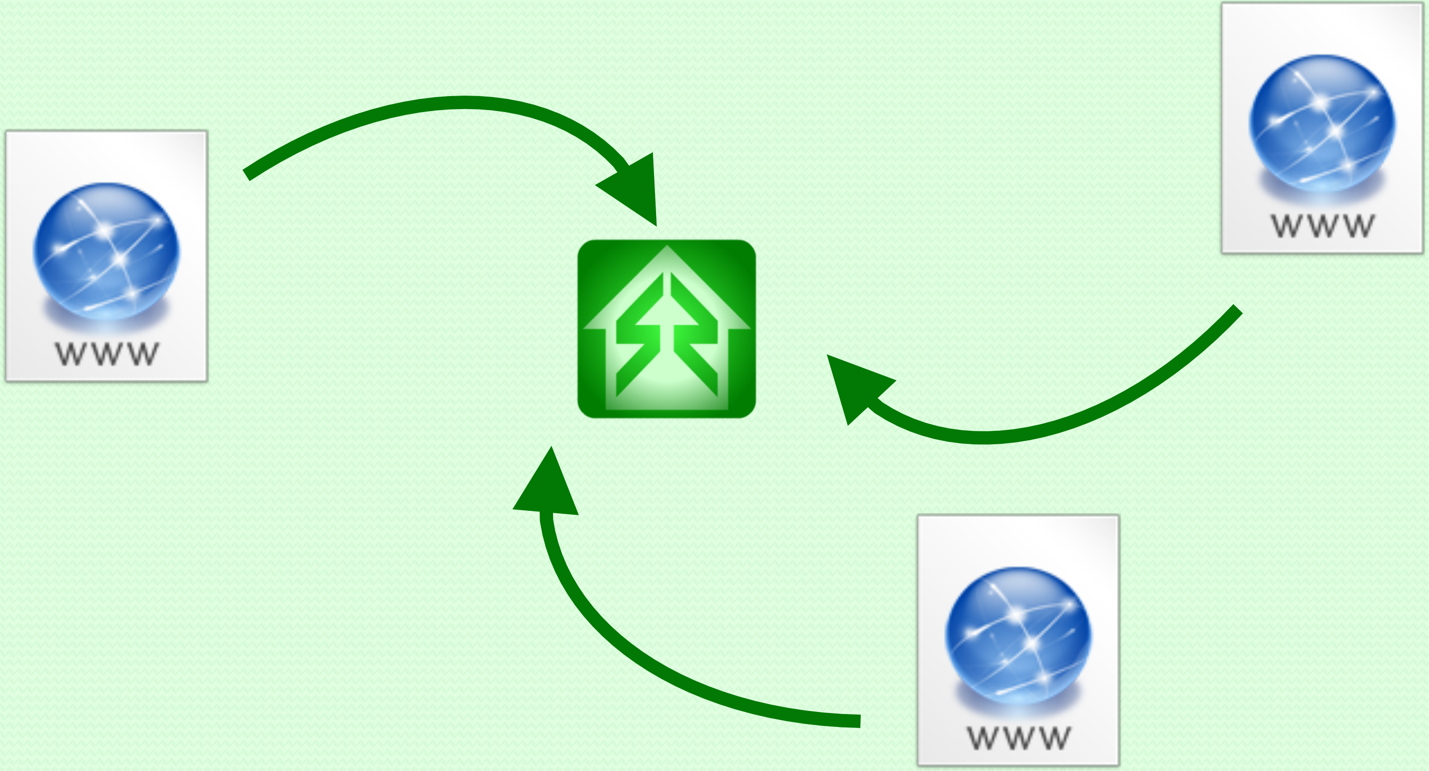
Portable

Flexible

Consistent

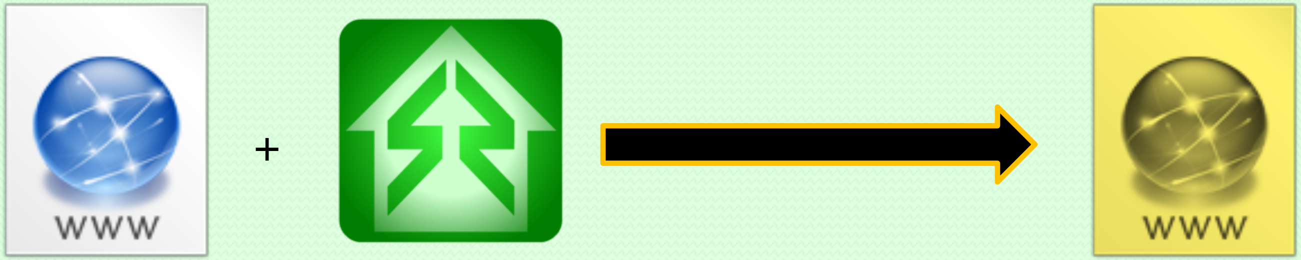
Our Solution – SOUL System

- The SOUL System aims to secure multiple websites all at once by providing a Software Development Kit and a Trusted Third Party for easy integration and registration.



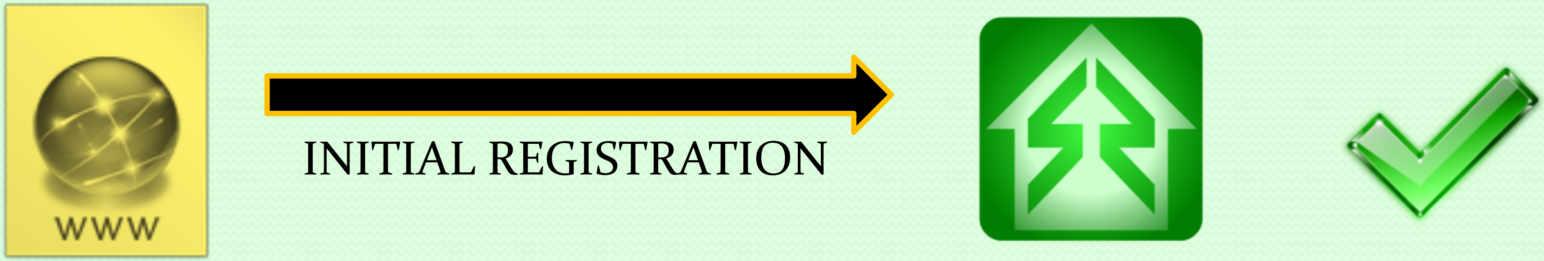
Our Solution – SOUL System

1) Website uses Software Development Kit to integrate existing website with the SOUL System



WEBSITE SOUL SDK SOUL INTEGRATED WEBSITE

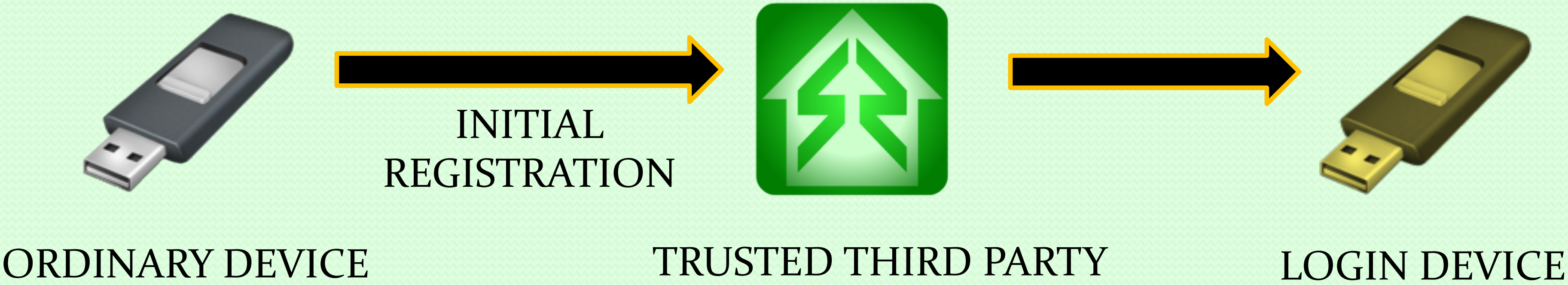
2) Website registers to the Trusted Third Party to allow TWO-FACTOR login (e.g. USB secure login)



SOUL INTEGRATED WEBSITE TRUSTED THIRD PARTY

Our Solution – SOUL System

1) User register s ordinary digita l device such as USB Flash drive in the Trusted Third Party in order to have a SOUL Account.



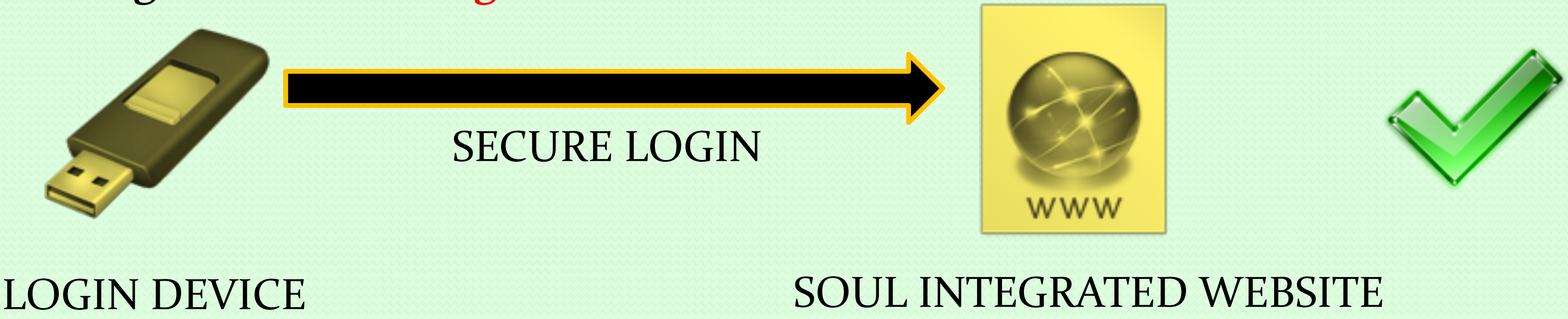
INITIAL REGISTRATION

ORDINARY DEVICE

TRUSTED THIRD PARTY

LOGIN DEVICE

2) Registered and processed login devices can now be used to register and login to SOUL Integrated Websites.



SECURE LOGIN

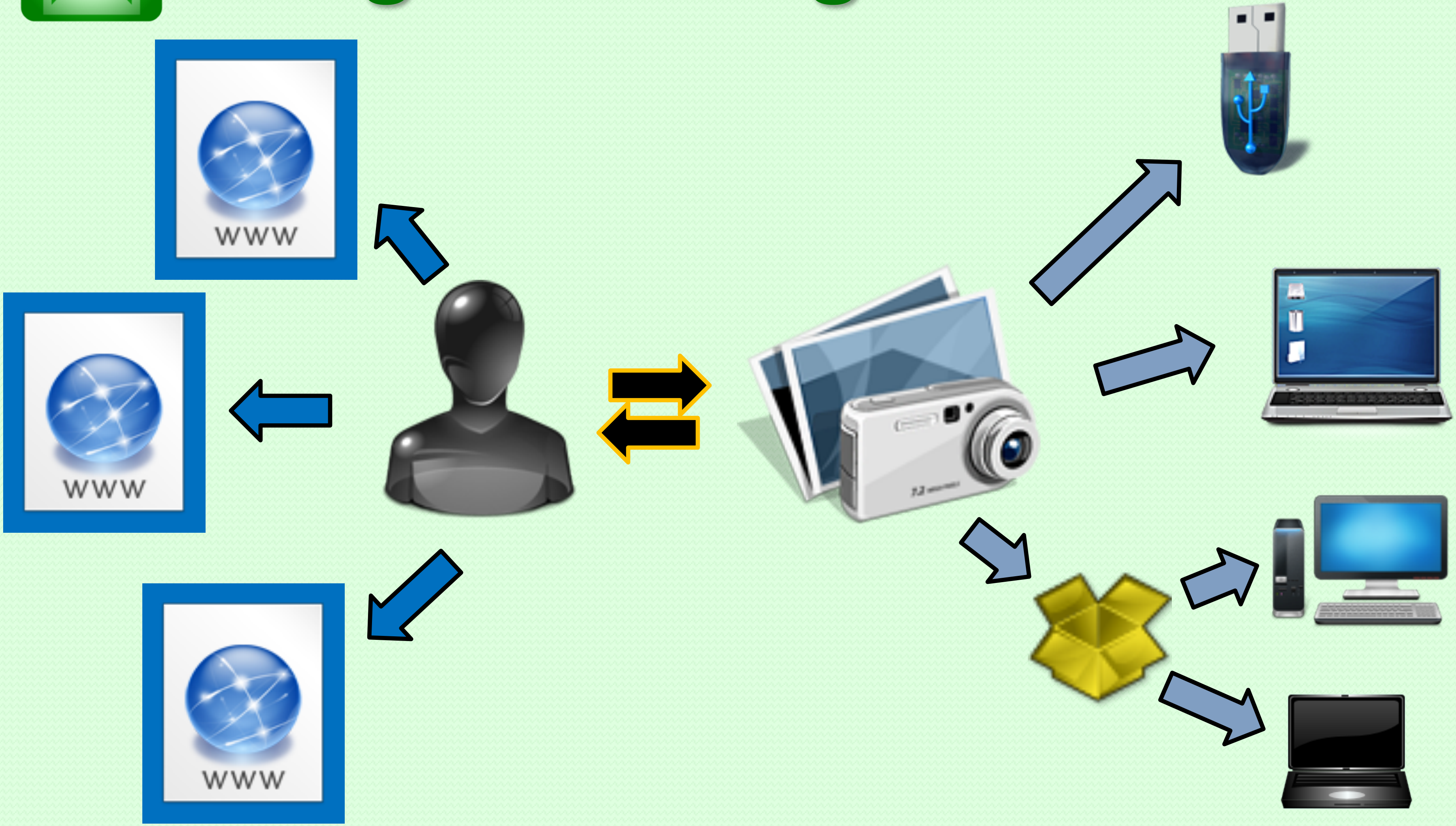
LOGIN DEVICE

SOUL INTEGRATED WEBSITE

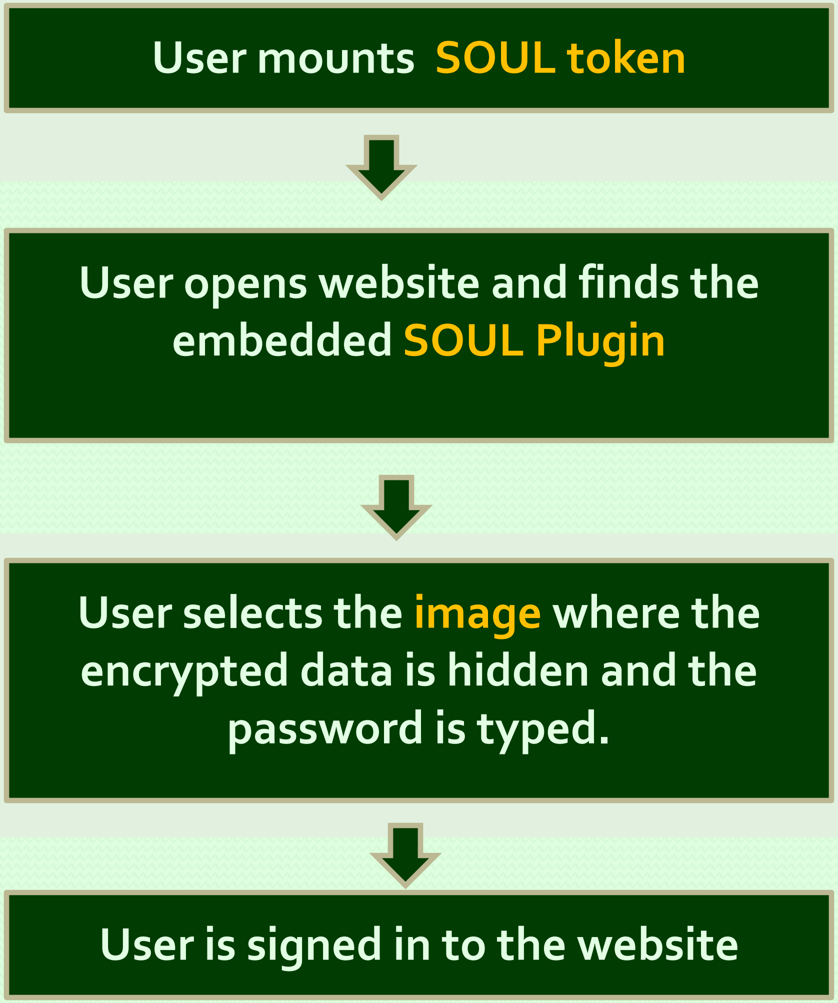
Design Challenges

- System should work in **major operating systems**.
- System can easily be integrated with **any existing website**
- System **must not require specialized hardware**
- System must be able to handle **lost, stolen, or corrupted physical passwords or keys**
- System must work with **very minimal installation**.

Design Challenges



Authentication Flow

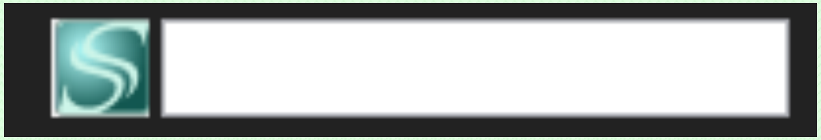


User mounts **SOUL token**

User opens website and finds the embedded **SOUL Plugin**

User selects the **image** where the encrypted data is hidden and the password is typed.

User is signed in to the website

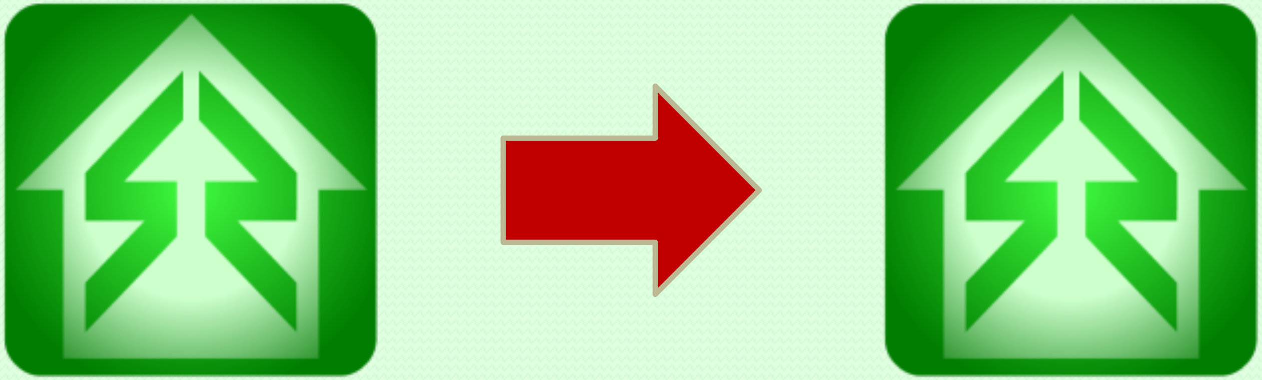


What Makes it Different?

- **“Plug and Play”** – Website integrates the SOUL System and registers to the Trusted Third Party to allow secure login
- **Low-Cost and low–maintenance** - No specialized hardware devices and system relies heavily on program codes
- **Portable to website users** – No operating system restriction and nothing installed in login devices
- **Extremely flexible** – The design of the system can be modified to fit the needs of the business
- **It’s secure and it’s a champ** – Kaspersky International Cup 2012 and Kaspersky Asia Pacific & MEA Cup Winning Research Paper

Secure Storage

- Steganography

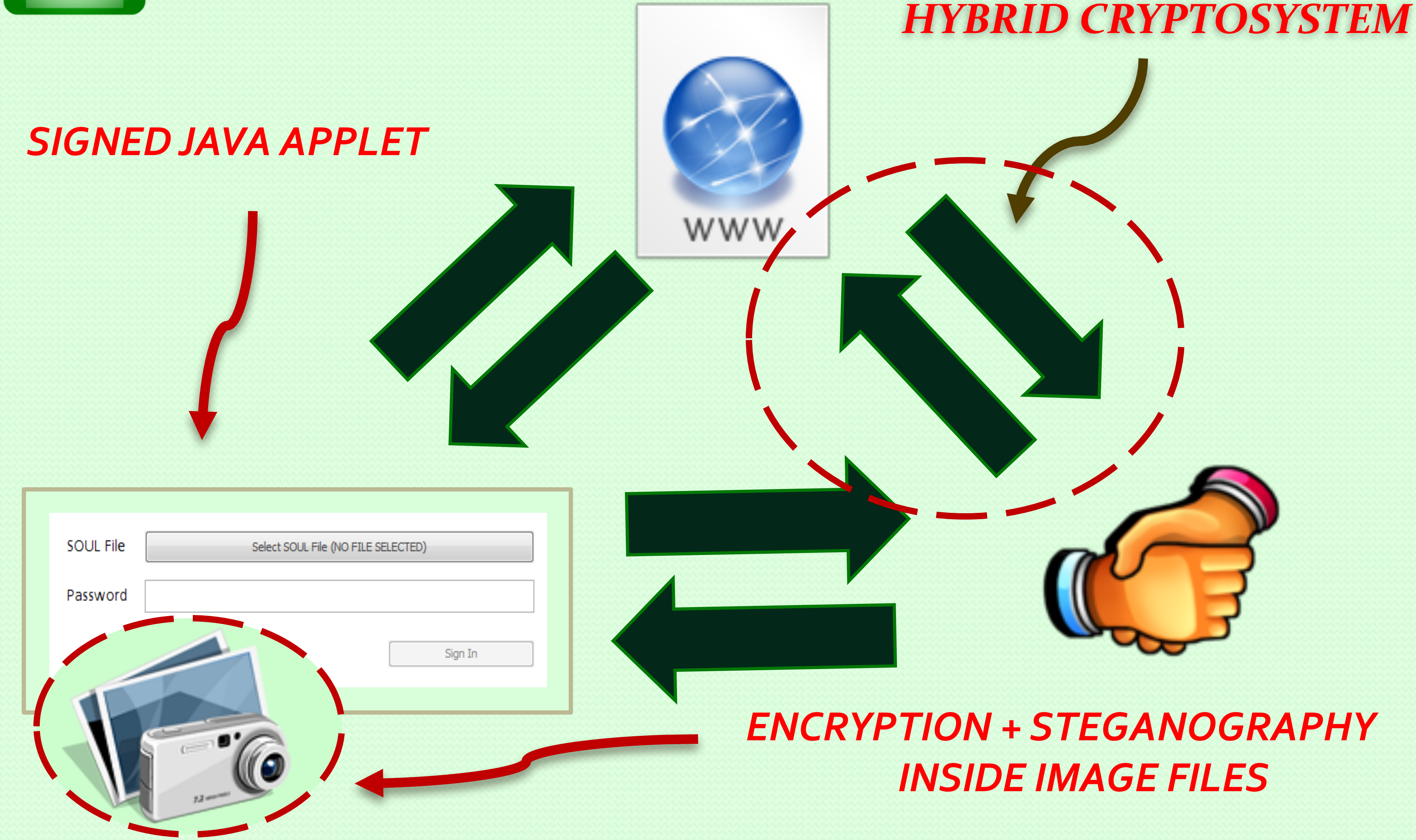


Old Image

New Image
(looks the same but with encrypted data)

Trick: **Hide encrypted data inside images!**
Result: Secure + Invisible. Ordinary USB Flash drive containing image still looks ordinary!

Secure Data Transfer

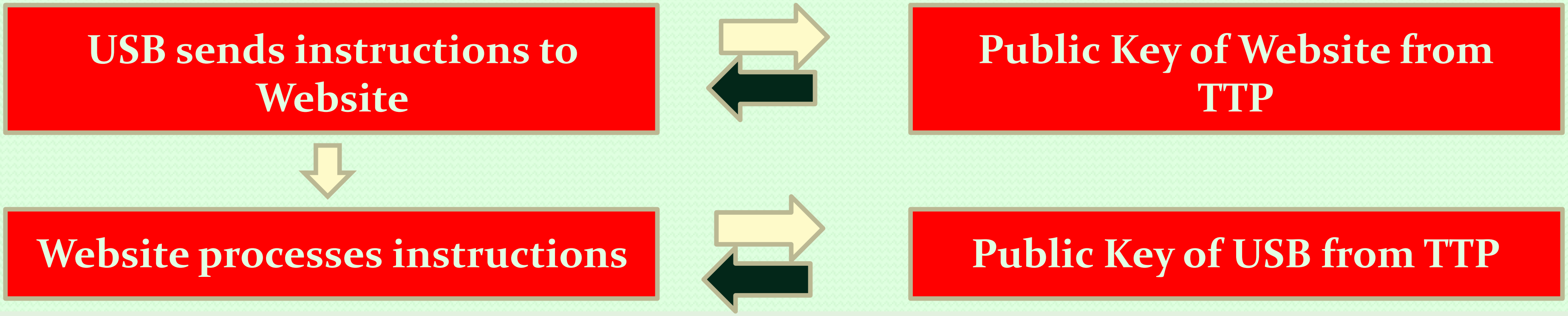


HYBRID CRYPTOSYSTEM

SIGNED JAVA APPLET

ENCRYPTION + STEGANOGRAPHY
INSIDE IMAGE FILES

Implementation


USB sends instructions to Website

Public Key of Website from TTP

Website processes instructions

Public Key of USB from TTP

1	XLCrypt and SOUL System SDK	Java / Python / PHP RSA, AES, SHA-512, and other fxns
2	Signed Java Applet	Embedded in website Has local filesystem access
3	Trusted Third Party	Primarily acts as storage of public keys & file hash values of image files

Fighting against known attacks

- Keylogging attack
- Brute-force attack
- Collision attack
- Dictionary attack
- Man-in-the-middle attack
- Reply attack
- Cloning attack

Objective	Results and Analysis
Security	System has been secured with hybrid cryptosystem and other security features such as UUIDs, Message UUIDs, RSA Signing and Verification, double password hashing
Cost	Low-cost: No specific hardware components required to use the system
Portability	No programs are installed inside security tokens. Any hardware or digital container can be used (laptops, USB flash drives, cellphones, dropbox containers)
Flexibility	System currently supports Java, Python, and PHP websites. The protocol and mechanisms proposed in the system can support any language (e.g. Ruby).
Visibility	Data is encrypted and then stored inside image files. No programs are installed inside the security tokens.
Practicality	Backup key system, password change possibility even with 2 keys, additional security options because of flexibility of usage (laptops as security tokens, dropbox storage as security tokens, cellular phones as security tokens)

The End